

CLAIMS

What is claimed is:

1. A paper feeding apparatus comprising:
a frame forming one of a paper stacker and a paper feed tray on which paper is stackable;
a paper feed unit disposed above the frame and including a pickup roller which picks up the paper; and
an active paper separator disposed at a lower part of the frame in the paper feeding direction thereof, contacting leading ends of sheets disposed in the frame, rotatable in an anti-paper feeding direction opposite the feeding direction so as to actively rub the leading ends and thereby separate and feed the sheets one at a time when the sheets of paper are picked up by the pickup roller.
2. The apparatus of claim 1, wherein the active paper separator includes:
a friction part disposed at the lower part in the paper feeding direction and rotatable while supporting the leading ends so that the sheets enter at a paper-entering angle; and
a driving part which rotates the friction part in association with a driving source which drives the paper feed unit.
3. The apparatus of claim 2, wherein the friction part includes:
a friction belt rotatably disposed at an angle; and
first and second belt pulleys rotatably respectively supporting ends of the friction belt at the lower part in the paper feeding direction.
4. The apparatus of claim 3, wherein the first and second belt pulleys are spaced by a distance greater than a length of the friction belt.
5. The apparatus of claim 3, wherein the friction belt is swingable between a first and a second position due to a droop characteristic of the belt.
6. The apparatus of claim 3, wherein the friction belt is a rubber material.

7. The apparatus of claim 3, wherein first pulley is rotatably supported on a driving axis and the second pulley is rotatably supported by a belt pulley supporting axis.

8. The apparatus of claim 7, wherein the driving axis and the second belt pulley supporting axis are supported at a support of the lower part and of the frame in the paper feeding direction.

9. The apparatus of claim 3, wherein the friction part further includes a friction adjusting member which adjusts a tension of the friction belt so as to always yield a frictional force to the leading ends.

10. The apparatus of claim 9, wherein the friction adjusting member includes:
a tension adjusting roller disposed in contact with the friction belt; and
a tension adjusting roller supporting axle rotatably supporting the tension adjusting roller at the lower part in the paper feeding direction.

11. The apparatus of claim 3, wherein the driving part includes:
a driving gear disposed so that at least a part thereof projects one of outwardly and upwardly from the lower part in the paper feeding direction and connected to the driving source which drives the paper feed unit via a gear train; and
a driving axle coaxially connecting the driving gear and one of the first and the second belt pulleys.

12. The apparatus claim 11, further comprising at least one paper separating plate fixedly disposed at the angle at the lower part in the paper feeding direction which separates and feeds the sheets of paper one at a time while supporting the leading ends of the sheets stacked in the frame so that the sheets enter at the paper-entering angle in association with the friction part, when the sheets of paper are picked up by the pickup roller.

13. The apparatus of claim 13, further comprising a paper separating assembly having plural paper separating plates inclined at an angle at an inclined surface of the lower part and in the paper feeding direction of the frame.

14. The apparatus of claim 3, wherein the angle is about the same as the paper-entering angle.

15. The apparatus of claim 1, wherein the active paper separator includes:
a friction part rotatably disposed at the lower part in the paper feeding direction so that at least one tangent line thereof intersects the leading ends of the sheets, in order to separate and feed the sheets one at a time; and
a driving part which rotates the friction part in association with a driving source which drives the paper feed unit.

16. The apparatus of claim 15, wherein the friction part includes a roller assembly having at least one rotating roller [rotatably disposed] and, when the roller assembly includes more than one rotating roller, the rotating rollers share a common tangent line inclined at an angle and which intersects the leading ends of the sheets.

17. The apparatus of claim 16, wherein the at least one rotating roller is formed to slightly swing regularly or irregularly within a range beyond paper separating plates of a paper separating assembly so as to yield a frictional force to the leading ends of the sheets picked up by the pickup roller.

18. The apparatus of claim 17, wherein the at least one roller has fine projections formed on a surface thereof.

19. The apparatus of claim 16, wherein the at least one roller is five rollers.

20. The apparatus of claim 16, wherein the at least one rotating roller is a rubber material.

21. The apparatus of claim 16, wherein the driving part includes:
a driving gear disposed so that at least a part thereof projects one of outwardly and upwardly from the lower part in the paper feeding direction and connected to the driving source which drives the paper feed unit via a gear train; and
a driving axle coaxially connecting the driving gear and the rotating roller.

22. The apparatus of claim 21, further comprising at least one paper separating plate fixedly disposed at the angle at the lower part in the paper feeding direction which separates and feeds the sheets of paper one at a time while supporting the leading ends of the sheets stacked in the frame so that the sheets enter at the paper-entering angle in association with the friction part, when the sheets of paper are picked up by the pickup roller.

23. The apparatus of claim 15, wherein the friction part includes a plurality of rotating rollers rotatably disposed and having a common tangent line inclined at an angle so as to intersect the leading ends of the sheets, and a plurality of rotating roller supporting axles respectively supporting the plurality of rotating rollers,

wherein the driving part includes a driving gear having at least a part thereof projecting one of outwardly and upwardly from the lower part in the paper feeding direction so as to connect with the driving source which drives the paper feed unit via a gear train, a driving axle one of forming the plurality of rotating roller supporting axles and coaxially connecting the driving gear and one of the plurality of the rotating rollers, a plurality of rotating roller gears coaxially formed on the respective rotating roller supporting axles, and a plurality of idle gears disposed between the rotating roller gears.

24. The apparatus of claim 23,
further comprising at least one paper separating plate fixedly disposed at the angle at the lower part in the paper feeding direction which separates and feeds the sheets of paper one at a time while supporting the leading ends of the sheets stacked in the frame so that the sheets enter at the paper-entering angle in association with the friction part, when the sheets of paper are picked up by the pickup roller.

25. The apparatus of claim 15, further comprising a paper separating assembly having plural paper separating plates inclined at an angle at an inclined surface of the lower part and in the paper feeding direction of the frame.

26. An image forming apparatus comprising:
an image former; and

a paper feeder having a frame forming one of a paper stacker and a paper feed tray on which paper is stackable, a paper feed unit disposed above the frame and including a pickup roller which picks up paper, and an active paper separator disposed at a lower part of the frame in the paper feeding direction thereof, contacting leading ends of sheets disposed in the frame, rotatable in an anti-paper feeding direction opposite the feeding direction so as to actively rub the leading ends and thereby separate and feed the sheets one at a time when the sheets of paper are picked up by the pickup roller.